REMARKS

This Amendment After Final Rejection is submitted in response to the outstanding final Office Action, dated April 6, 2006. Claim 26 was added in the Amendment and Response to Office Action dated March 20, 2006. Claims 1 through 26 are presently pending in the above-identified patent application. Claims 1 and 13 are proposed to be amended herein. No additional fee is due.

This amendment is submitted pursuant to 37 CFR §1.116 and should be entered. The Amendment places all of the pending claims, i.e., claims 1 through 26, in a form that is believed allowable, and, in any event, in a better form for appeal. It is believed that examination of the pending claims as amended, which are consistent with the previous record herein, will not place any substantial burden on the Examiner. In any case, a Request for Continued Examination is being submitted herewith.

In the Office Action, the Examiner rejected claims 1-6, 11, 13-18, 23, 25, and 26 under 35 U.S.C. §102(e) as being anticipated by Wilkerson (United States Patent Application Publication Number 2005/0015555). The Examiner indicated that claims 7-10, 12, 19-22, and 24 would be allowable if rewritten in independent form including all of the limitations of the base claims and any intervening claims.

Independent Claims 1 and 13

Independent claims 1 and 13 were rejected under 35 U.S.C. §102(e) as being anticipated by Wilkerson. Regarding claim 1, the Examiner asserts that Wilkerson teaches "determining new state information (i.e. new number of times the cache line being read/hit) for at least two given cache lines of a plurality of cache lines in a cache (i.e. at least two cache lines have to be examined to find out which cache line is the most frequently used compare to other cache line(s)), the new state information based at least in part on prior state information for the at least two given cache lines (i.e. new number of times the cache line being read/hit is always based on the prior number of hits); and when an access miss occurs in one of the at least two given lines: selecting either LFU or MFU replacement criteria (i.e. selecting the MFU replacement criteria); and replacing one of the at least two given cache lines based on the new state information and the selected replacement criteria." In the final Office Action, the Examiner acknowledges

that Wilkerson does not disclose or suggest a single embodiment where both LFU and MFU techniques are utilized, but asserts that this limitation is not recited in claims 1 and 13.

In the text cited by the Examiner, Wilkerson teaches that "*in **another** embodiment, the most-frequently-used (FRQ) cache line may be selected.*" (Paragraph 22; emphasis added.) Wilkerson does not disclose or suggest a single embodiment where both LFU and MFU techniques are utilized and, thus, Wilkerson does ***not*** disclose or suggest selecting either LFU or MFU replacement criteria *based on a selection signal*, as would be apparent to a person of ordinary skill in the art. Independent claims 1 and 13 require selecting either LFU or MFU replacement criteria, *wherein said selection is based on a **selection signal***, as amended.

Thus, Wilkerson does not disclose or suggest selecting either LFU or MFU replacement criteria, wherein said selection is based on a selection signal, as required by independent claims 1 and 13, as amended.

Independent Claim 25

Independent claim 25 was rejected under 35 U.S.C. §102(e) as being anticipated by Wilkerson. Regarding claim 25, the Examiner asserts that Wilkerson discloses replacement circuitry adapted to replace the given cache line determined as the most frequently used (paragraph 22 and FIGS. 2-3). In the final Office Action, the Examiner asserts that Wilkerson teaches that, whenever an access miss occurs (i.e., a cache miss occurs) in one of the at least two given lines (see line 2 of paragraph [0021]), selecting either LFU or MFU replacement criteria (i.e., selecting the MFU replacement criteria).

Applicants note that Wilkerson teaches to use a MFU technique for *identifying a likely **Prefetch** line*; Wilkerson does ***not*** disclose or suggest utilizing a MFU technique *to identify a **replacement** line*. Independent claim 25 requires "*replacement circuitry adapted to replace the given cache line* determined as the most frequently used."

In addition, Applicants note that Wilkerson teaches that

> the most-frequently-used (FRQ) cache line may be selected. One manner of determining the FRQ cache line may be to

> associate a counter, of a small number of bits, with each cache line in L1 cache 340. In one embodiment, the number of bits may be 8 or 16. The *counter may be incremented each time the cache line is referenced, and* ***may be set to zero when a cache line is replaced.*** To determine the FRQ cache line of a set, the counters may be examined and the cache line with the highest counter value may be selected as the FRQ cache line. This large number of counters and logic may be burdensome to the designer. In another embodiment, a pseudo-most-frequently-used (PFRQ) cache line may be used as an ISL value. In one embodiment, the PFRQ may be determined ***using a 3-bit saturating counter*** and a R-bit tag when the cache is 2R-way. The R-bit tag may point to an initial FRQ candidate cache line in the set. Each cache hit to the set may produce the relative age of the referenced cache line, which may be compared to the relative age of the FRQ candidate cache line. If the relative age of the referenced cache line is less than the current RFQ candidate cache line, the 3-bit saturating counter may be incremented. If the relative age of the referenced cache line is more than the current RFQ candidate cache line, the 3-bit saturating counter may be unchanged. If the relative age of the referenced cache line is equal to the current RFQ candidate cache line, the 3-bit saturating counter may be decremented.
> (Paragraph 0022; emphasis added.)

As would be apparent to a person of ordinary skill in the art, the embodiments disclosed by Wilkerson will ***not maintain a relative MFU count*** *to indicate the frequency of use of a cache line relative to one or more other cache lines* in cases where, for example, the usage count exceeds the maximum count or saturation count of the MFU counter. Independent claim 25 requires wherein said state information *includes at least one relative MFU count*; and MFU circuitry adapted to produce new state information for the at least two given cache lines in response to an access to one of the at least two given cache lines *and to* ***maintain*** *said at least one* ***relative MFU count*** *to indicate a frequency of use of at least one of said given cache lines relative to one or more of said given cache lines.*

Thus, Wilkerson does not disclose or suggest wherein said state information includes at least one relative MFU count; and MFU circuitry adapted to produce new state information for the at least two given cache lines in response to an access to one of the at least two given cache lines and to maintain said at least one relative MFU count to indicate a frequency of use of at least one of said given cache lines relative to one or more of said given cache lines, and does not disclose or suggest

replacement circuitry adapted to replace the given cache line determined as the most frequently used, as required by independent claim 25, as amended.

Dependent Claims 2-12, 14-24 and 26

Dependent claims 2-6, 11, 14-18, 23, and 26 were rejected under 35 U.S.C. §102(e) as being anticipated by Wilkerson.

Claims 2-12, 14-24, and 26 are dependent on claims 1, 13, and 25, respectively, and are therefore patentably distinguished over Wilkerson because of their dependency from amended independent claims 1, 13, and 25 for the reasons set forth above, as well as other elements these claims add in combination to their base claim. The Examiner has already indicated that claims 7-10, 12, 19-22, and 24 would be allowable if rewritten in independent form including all of the limitations of the base claims and any intervening claims.

All of the pending claims, i.e., claims 1-26, are in condition for allowance and such favorable action is earnestly solicited.

If any outstanding issues remain, or if the Examiner has any further suggestions for expediting allowance of this application, the Examiner is invited to contact the undersigned at the telephone number indicated below.

The Examiner's attention to this matter is appreciated.

Respectfully submitted,

Kevin M. Mason

Date: June 2, 2006

Kevin M. Mason
Attorney for Applicants
Reg. No. 36,597
Ryan, Mason & Lewis, LLP
1300 Post Road, Suite 205
Fairfield, CT 06824
(203) 255-6560